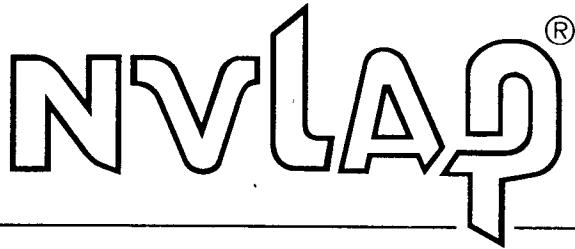


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CALIBRATION LABORATORIES

NVLAP LAB CODE 105020-0

PACIFIC NORTHWEST NATIONAL LABORATORY / BATTELLE

Battelle Boulevard
P.O. Box 999
Richland, WA 99352
Mr. R. Kim Piper
Phone: 509-376-6187 Fax: 509-376-1992
E-Mail: kim.piper@pnl.gov
URL: <http://www.pnl.gov/eshs/>

This facility has demonstrated compliance with the NVLAP Criteria for Calibration Laboratories under the field of Ionizing Radiation for the following:

Calibration Category	Radiation Type or Beam Code	Nominal Intensity Range ^{note 3}	Uncertainty of Reference Field (\pm) ^{note 1,2}
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CALIBRATION OF SURVEY INSTRUMENTS

Gamma	^{241}Am	0.125 R/h	5.2%
	^{137}Cs	0.1 to 250 R/h	1.5%
	^{60}Co	4 to 60,000 R/h	1.5%
X-ray	M30	3 to 500 R/h	1.5%
	M50	4 to 600 R/h	1.5%
	M60	3 to 450 R/h	1.5%
	M100	3 to 500 R/h	1.5%
	M150	4 to 550 R/h	1.5%

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	M200	4 to 650 R/h	1.5%
	S60	1 to 175 R/h	1.5%
	S75	5 to 700 R/h	1.5%
	H40	0.02 to 4 R/h	1.5%
	H50	0.05 to 10 R/h	1.5%
	H100	0.02 to 3 R/h	1.5%
	H150	1 to 15 R/h	1.5%
	H200	0.9 to 9 R/h	1.5%
	H250	0.9 to 9 R/h	1.5%
	H300	0.6 to 3 R/h	1.5%
Beta	²⁰⁴ Tl	0.9 rad/h	4.4%
	⁹⁰ Sr/ ⁹⁰ Y	0.4 to 19 rad/h	4.0%
Neutron	²⁵² Cf Bare	0.014 to 4.8 rem/h	7.6%
	²⁵² Cf Moderated	0.004 to 1.1 rem/h	21.4%

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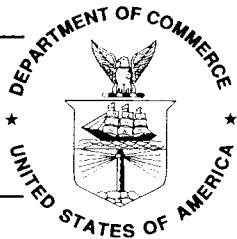
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<i>Calibration Category</i>	<i>Radiation Type or Beam Code</i>	<i>Nominal Range^{note 3}</i>	<i>Uncertainty of Delivered Quantity (±)^{note 1,2}</i>
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IRRADIATION OF PERSONNEL DOSIMETERS

Gamma	^{241}Am	$\geq 0.002 \text{ R}$	5.4%
	^{137}Cs	$\geq 0.020 \text{ R}$	3.6%
	^{60}Co	$\geq 0.025 \text{ R}$	3.6%
X-ray	M30	$\geq 0.025 \text{ R}$	3.6%
	M50	$\geq 0.035 \text{ R}$	3.6%
	M60	$\geq 0.025 \text{ R}$	3.6%
	M100	$\geq 0.025 \text{ R}$	3.6%
	M150	$\geq 0.035 \text{ R}$	3.6%
	M200	$\geq 0.035 \text{ R}$	3.6%
	S60	$\geq 0.010 \text{ R}$	3.6%
	S75	$\geq 0.040 \text{ R}$	3.6%
	H40	$\geq 0.0002 \text{ R}$	3.6%

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	H50	≥ 0.0005 R	3.6%
	H100	≥ 0.0002 R	3.6%
	H150	≥ 0.008 R	3.6%
	H200	≥ 0.008 R	3.6%
	H250	≥ 0.008 R	3.6%
	H300	≥ 0.005 R	3.6%
Beta	^{204}Tl	≥ 0.015 rad	11.8%
	$^{90}\text{Sr}/^{90}\text{Y}$	≥ 0.007 rad	5.4%
Neutron	^{252}Cf Bare	≥ 0.001 rem	8.0%
	^{252}Cf Moderated	≥ 0.002 rem	22.4%

CALIBRATION OF REFERENCE-CLASS INSTRUMENTS

Calibration Category	Radiation Type or Beam Code	Nominal Intensity Range ^{note 3}	Uncertainty of Reference Field (\pm) ^{note 1,2}
Gamma	^{137}Cs	0.1 to 250 R/h	1.5%

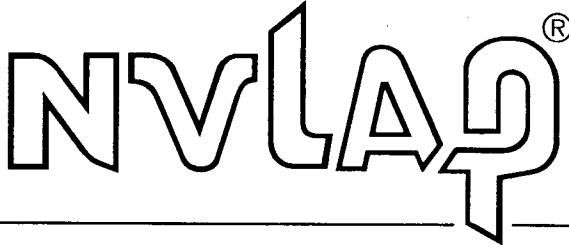
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	⁶⁰ Co	4 to 60,000 R/h	1.5%
X-ray	M30	3 to 500 R/h	1.5%
	M50	4 to 600 R/h	1.5%
	M60	3 to 450 R/h	1.5%
	M100	3 to 500 R/h	1.5%
	M150	4 to 550 R/h	1.5%
	M200	4 to 650 R/h	1.5%
	S60	1 to 175 R/h	1.5%
	S75	5 to 700 R/h	1.5%
	H40	0.02 to 4 R/h	1.5%
	H50	0.05 to 10 R/h	1.5%
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	H200	0.9 to 9 R/h	1.5%
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	H300	0.6 to 3 R/h	1.5%

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-
1. Values listed at the 95% confidence level.
 2. Uncertainties are valid for nominal intensity range listed.
 3. For calibration outside of the nominal intensity range shown, uncertainties would be determined commensurate with the parameters of the reference field calibration.

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